

ART. II.—*The Introduction and Spread of the Cattle Tick (Boophilus annulatus, var. microplus), and of the Associated Disease Tick Fever (Babesiosis) in Australia.*

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Australia, although a large portion of its local area is situated within the tropical belt, is happily free from almost all those protozoan diseases which affect the domesticated animals in tropical regions elsewhere. For this she has to thank not quite so much the foresight of her administrators, as her insular position, the fact that no domesticated animal is indigenous, and above all, the fact that all her importations have been derived almost solely from the original home of her people, namely, Great Britain.

Nevertheless, there are at least two specific diseases present in Australia, both affecting cattle, and both the cause of considerable pecuniary loss to stockowners, either directly or indirectly, and these are diseases which are unknown amongst British stock. The diseases in question are "Tick Fever" or "Redwater" (*Babesiosis*) and the so-called "Worm Nodules," due to the parasite *Onchocerca gibsoni*, which is dealt with in another paper.

Tick fever is not found all over Australia. It is rare in the southern States, and has not yet appeared far south of the tropical border. The evidence all points to its greater prevalence the further north stock are pastured.

Now, as the Australian tick fever is not present amongst the British herds which have formed the basis of our Australian herds, it is highly incumbent on us to ascertain exactly how it came to be introduced, or at least the most probable sources of introduction. But to do so one must first of all consider which countries are most likely to have been in a position to affect Australia in such a manner.

So far as I can gather there are no official records of stock importations ever having been made through any ports other than the main ports of the southern part of the continent and Queensland. At these ports there has been almost from the earliest days of settlement a more or less satisfactory system of inspection and quarantine, and the most cursory official examination could have hardly failed to detect the tick parasite, which is a necessary agent in the natural transmission of

tick fever. Had its presence been overlooked in any instance, one is safe in concluding that it would have been heard of primarily in one of the southern districts. But we hear of its appearance first in the northern parts of the tropical regions, far away from known ports of cattle entry.

One is therefore impelled to the conclusion that the disease must have entered by way of the northern littoral, unless indeed it be assumed that the same tick parasite affects indigenously the native fauna, for which assumption there is absolutely no evidence. Irresistibly we are compelled to look to the countries lying north of Australia as the possible source of original infection.

The nearest territory whereon cattle are husbanded is the Dutch Indies. There we know that the tick is a common parasite among the native cattle, and that although these cattle exhibit a great natural immunity to the blood-parasite (*Babesia*), the true cause of tick fever, which is transmitted by the tick, yet imported non-immune cattle are very susceptible, at least in the Straits Settlements adjacent, and unless special precautions are adopted, are almost certain to succumb in considerable numbers. The same conditions obtain in other tropical countries lying farther north.

Our nearest neighbour has, therefore, this tropical disease of cattle. But we are separated from her by hundreds of miles of sea, communication is infrequent, and besides, there are no official records of the importation of cattle therefrom to Australia. If it can be shown that live cattle have been imported notwithstanding, the position becomes clear. If not, it seems obvious that other agencies must be looked for, and that if this disease has been introduced by unknown means, other and perhaps more to be dreaded tropical animal maladies may be introduced in the future; indeed, they may be at the present moment existing to some extent in our northern areas.

The buffalo naturally offered a possible solution. It is well known that the Governors of the British settlements at Melville Island and Port Essington (about 1826 and 1828) imported the mud or swamp-buffalo from Timor, and Johnston and Cleland have drawn attention to the fact that the Governor of the Port Essington settlement was also empowered to import cattle from the Netherlands Indies, though they could find no record of this having been done.

Since their introduction to Port Dundas by Sir Gordon Bremmer in 1824, the buffalo have spread all over Melville Island; and since their introduction to the mainland at Port Essington they have gradually spread southward along the swampy plains near the sea-coast to within a few miles of Port Darwin. A few have wandered inland, but chiefly bulls which have left the main herds, one or two being occasionally seen as far as the Roper and even the McArthur Rivers.

During my visit, thanks to the kindness of Mr. W. Lawrie, I had an opportunity of examining a number of fresh buffalo hides, besides a buffalo killed for my examination, and no ticks were detected thereon, although these animals were running on land where the cattle were badly tick-infested. Again in Melville Island I was enabled through the courtesy of Messrs. Robinson and Cooper to examine buffalo immediately after slaughter, and buffalo hides, and can testify to the freedom of these animals, at least at the time of my visit, from cattle ticks or other tick infection. This, it must be admitted, is in accordance with the experience of buffalo hunters generally.

Others, it is true, have assured me that they have actually seen the tick on the buffalo, and while not being in a position definitely to contradict these statements, I am inclined to the opinion that the large louse (*Haematopinus* sp.) which constantly affects these buffalo, may, in a cursory examination, have been mistaken for ticks; that they have been so confounded by some I am certain.

It should be here observed that about 1886, Indian buffalo (two cows and one bull) were brought to Port Darwin by the agency of the Government, with the intention of establishing the Ghi (or buffalo butter) industry. Some of the descendants of these buffalo may still be seen being employed as beasts of burden. They also are apparently tick-free, and in any case were introduced subsequent to the known appearance of redwater or tick fever in the north.

I think, therefore, the buffalo may be held guiltless of the charge of introducing the cattle disease in question, the chief reason being that to-day he is unaffected with the necessary skin parasite, even when grazing on the same land as badly-infected cattle.

The result of my enquiries, however, abolishes any necessity for assuming any other agent in the introduction than the live bovine animal itself. Through the kindness of Mr. J. Campbell, late Secretary of Agriculture, Sydney, I have been able to procure a copy of a despatch, being a report on the Port Essington Settlement, addressed to the British Government by Captain Everard Home, dated from H.M.S. "North Star," 19th April, 1843. Captain Home furnishes a description of the settlement at that date, and states, *inter alia*, "of stock they have one English cow and a bull, two Indian heifers and two cows, about 50 goats, and a few fowls. . . . There are besides 6 working oxen and 30 buffaloes and pigs, the property of the Government." That the descendants of these Indian cattle are still on the Coburg Peninsula is vouched for by Mr. E. O. Robinson, Mr. H. W. H. Stevens, Mr. R. J. Cooper, Mr. C. Freer, and others, who have traversed the country buffalo shooting, etc. The evidence is, however, that these cattle, unlike the buffalo, have not spread, and have never reached country occupied by station cattle. But that they would originally bring with them cattle ticks is almost undoubted.

Unfortunately at the time of my visit to Darwin there was no means enabling me to reach Port Essington, so that an examination of the descendants of the original cattle, interesting and important as such an examination would have been, was impossible.

But that this importation alone would not account for the spread of ticks through tropical Australia I am convinced, for the reason that the natural spread of ticks is by cattle, and rarely by other agencies. We may look to another and later importation of Brahma cattle as in all probability the true source of our trouble. Mr. H. W. H. Stevens, who was at that time connected with the British Australian Cable Company, informs me that in August, 1872, the settlement at Darwin, then Palmerston, being short of meat, the Company's vessel, the

Investigator," landed from Batavia twelve native cattle (eight cows and four bulls), and that some of these escaped. Some time after they were mustered by Mr. Stevens and taken to the Adelaide River, where they bred up to six or seven hundred head. This is confirmed by Mr. W. S. Stretton, Collector of Customs at Darwin, who was present at their landing, and who, in fact, afforded us the first definite information regarding this important fact. Furthermore, that Brahma cattle must at one time have been imported there I can personally testify, for on the Adelaide River I saw their crossbred descendants, amongst which was one old cow that might readily have passed as purebred Brahma. Mr. Lawrie, the owner of the station, very kindly had two of these crossbred Brahmas shot for me. They were well covered with ticks, and exhibited a large number of worm nodules, in the usual regions. As corroborative evidence incriminating this importation, what I have been able to ascertain regarding the appearance, and early spread of tick fever in the north is important. For this information I am largely indebted to Mr. Alfred Giles, who has been in the Territory for forty years, and has a diary covering the whole period, and to Mr. W. Lawrie, who has been for thirty years intimately connected with the live stock and meat trade, and to official records.

The first cattle to reach the northern part of the Territory were brought from Queensland overland *via* the Roper River in 1872 by Mr. D'Arcy Wentworth. The mob consisted of about 400 head, which were taken to the Peninsula opposite Port Darwin, and ultimately all slaughtered for beef. There is no evidence that any of these cattle were affected with redwater or other serious disease.

The next cattle to arrive was a mob of fat bullocks from the Macdonald Ranges, brought by Mr. T. Nelson in 1876, and owned by Mr. Abbott, a Port Darwin butcher. There is no history of redwater or ticks. Messrs. Giles arrived at the Katharine River in 1879 with 2000 cattle and 12,000 sheep for the purpose of stocking land acquired by the late Dr. W. J. Brown, of Adelaide. At that time both ticks and redwater were unknown in that district.

Redwater first appears to have been noted at Glencoe, distant 104 miles from Darwin by rail, about the years 1880-1. About this time a mob of cattle arrived at Glencoe from Queensland, and a large percentage soon succumbed to redwater. Mr. Lawrie bought a number to take to Port Darwin, but 50 per cent. died before reaching there. Subsequent arrivals at Glencoe experienced a like mortality. Gradually the disease and the ticks spread southward. About 1886, 150 head of cattle arrived from Newcastle Waters, at Katharine, where delivery was taken by Mr. A. Giles, who was to travel them north. Between there and Glencoe nearly 50 per cent. died from redwater. By 1887 the disease had spread to the Roper River, and by 1890 to the McArthur, being manifested chiefly, if not solely, in cattle travelling through from Queensland.

In the official reports presented to the South Australian Parliament from the Northern Territory, the earliest mention of redwater is in that of the Resident dated 1st January, 1886, which contains the statement that "of 3000 Wave Hill cattle passed to the westward, hundreds died of redwater." In the report of 1st July, 1886, these losses are again referred to, and also in some notes by Mr. A. Giles, then resident at Springvale, near the Katharine Station, who states that ticks on cattle and horses appeared here for the first time in any number this season, arguing a recent invasion of the district. In the report of 1st January, 1887, redwater is definitely referred to as a "serious disease." That its prevalence had previously been well known to settlers is indicated by a statement in the first report of a stock inspector, who stated that redwater "continues to be the *bête noir* of drovers from Queensland *via* the Roper River." Henceforth the disease assumes an increasing importance in these official reports for several years. In that of January, 1899, considerable space is devoted to its ravages, and Mr. H. W. H. Stevens affords some valuable information: "The first cattle that I know of to show redwater were Mr. C. B. Fisher's mobs that came along the Roper during the dry weather. . . . Out of 1700 we took delivery of in August, 1882, fully 400 died on arrival on the Glencoe run." He then fixes the locality where the trouble begins as "from the junction of the Hodgson River with the Roper River along the Roper west and north-west as far as its head, and in the neighbourhood of the King and Katharine Rivers for a few miles." He mentions three mobs from different parts, Gregory Downs, Queensland, Limmen Bight, Northern Territory, and Newcastle Waters, Northern Territory, which suffered a loss of from 20 to 30 per cent. from passing through the infected country. Yet Mr. A. Giles, then at Springvale on the Katharine, states the disease in cattle is unknown there, a position quite easily understood in the light of present-day knowledge.

In the next official report, 1890, the significant statement occurs: "It is generally stated that redwater (so-called) does not attack acclimatised or Territory-bred cattle." The chief complaint throughout is that overlanded cattle travelling from Queensland especially, alone exhibit the symptoms of the disease, and die therefrom. To-day, when the full nature of the disease is understood, these circumstances are not at all surprising. By 1891 the report shows that cattle coming from Queensland generally become affected between the McArthur and Roper Rivers, which proves that the disease was gradually spreading backwards towards the Queensland border along the stock routes.

It must be remembered that at this time, and, indeed, prior to the publication by Smith and Kilborne in 1893 of the records of their exhaustive experiments, the relationship between redwater and ticks was not appreciated. It will be understood therefore that the spread of the visible parasite, the tick, was not associated in the public mind with the specific and deadly disease redwater. Ticks always appear in a new district for some time before there is any definite occurrence of the disease redwater, and indeed their multiplication may be so gradual that, beyond "tick worry," especially where the land is sparsely stocked, as in the Northern Territory, the majority may become gradually immune to the specific blood parasite, the actual cause of redwater, conveyed by the tick.

That ticks and consequently the disease redwater or tick fever originally reached Queensland from the Northern Territory, the reports of the officers of the Queensland Department of Agriculture leave no doubt. About 1894 Mr. C. J. Pound, Government bacteriologist, was commissioned by the Government to visit the Gulf district, and report on the so-called "redwater" disease, which was just then commencing to devastate some of the station herds.

From the exhaustive enquiries made by Mr. Pound, he arrived at the conclusion that the disease was introduced into the Gulf country from the Northern Territory by cattle tick-infested, but themselves redwater immune, brought to Queensland as the result of the establishment of boiling-down works at Burketown and Normanton. (Queensland Agricultural Journal, June, 1907, Vol. XVIII., pt. 6, p. 283.)

The whole of the evidence which I have been able to secure from official and private sources, although varying slightly in detail, as is to be expected, points to the gradual advancement of the disease redwater, which we know to-day to be tick-borne, and tick-borne only, from the point of its original and earliest appearance—Glencoe Station, some hundred miles south of Darwin. This is exactly what might now be assumed *a priori* would happen given the introduction of ticks by the Brahma cattle, which were turned out near Port Darwin in 1872. They were taken to the Adelaide River, where they rapidly multiplied.

During the wet summer months when the lowlying coastal lands are swampy, some, if not all, would seek higher and drier grazing lands inland. Being unable to cross the Adelaide, they would keep to the left bank, some in straying would ultimately reach and mingle with the nearest station cattle at the time, which would be those of Glencoe. Thus they would gradually, but surely, carry the ticks, and so infest the land with the eggs and larvae. These larvae, though by virtue of gradual infection of station cattle they might not seriously affect them with the blood parasite, would almost certainly seriously affect fresh non-immune arrivals that would suddenly be attacked by numbers of the skin parasites, and thus the appearance of redwater amongst the Queensland cattle reaching Glencoe about 1880-1881 seems sufficiently accounted for. Not all these cattle would succumb to the fever. Many would be but slightly affected: others would recover, though possibly be left as useless. Such travelled cattle, when they leave the mob, naturally tend to return over the route they have traversed, and seek their original home. In this way the tendency would be for the ticks to become carried further inland and backwards gradually towards the Queensland border, as we see was the case. The whole evidence, although circumstantial, incriminates the importation of Asiatic cattle by the British-Australian Telegraph Company in 1872 as the actual agent of the introduction of ticks (*Boophilus annulatus* var. *microplus*) and tick fever (*Babesiosis*) to Australia. As against the likelihood of the Cable Company's importation of Batavian cattle having introduced ticks, I must quote Mr. H. W. H. Stevens's assurance that during the voyage these cattle were daily washed with sea-water, and that no ticks were observed on them during the voyage and on their arrival. This may be so, but so far as the sea-water baths are concerned they would not destroy living ticks, judging by experience of the application of much more potent solutions, and everyone with experience of these parasites knows how easy it is to overlook them when but comparatively few are present. Writing me in regard to this subject, Mr. Stevens states: "Although there was a small mob of English cattle depastured at the Jungle 12 miles from Darwin, belonging to the Government, I never heard any reference to ticks, nor did I see them on these cattle up to the year 1875. We had also milch cows and other stock in the settlement, but it was not until some years later, say 1880, that any trouble from tick was experienced." This is additional proof that ticks were not originally in the Territory. Such cattle were not mixed with the Brahmas, and probably the infection reached Darwin itself by a circuitous route from the native herd on the Adelaide River.

Briefly my reasons for suspecting this importation of cattle as the introducers of ticks and redwater to Australia are as follows:—

1. All cattle in the Dutch Indies are more or less affected with ticks, although naturally immune to redwater.

2. This is the only importation of native Eastern cattle which have been able to cross with station cattle.

3. These cattle we know travelled inland as far as the Adelaide River.

4. It is more than likely some of their progeny would gradually reach from there the main stock route from the South to Darwin.

5. This point would be somewhere about Glencoe.

6. At Glencoe about eight years after the introduction of these Eastern cattle, redwater as an epidemic and serious disease first appeared in Australia.

7. The disease redwater only affected travelling non-immune cattle on reaching Glencoe.

8. The evidence strongly points to the gradual spread of ticks and redwater to other parts of the continent along the stock routes from this point, by cattle which had been sick and recovered, tending to travel backwards in the direction of their original home, and in this way disseminating the ticks.